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US-A- 1 453 032**

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## Description

The present invention relates to a motor vehicle gearbox, comprising a housing with at least one input shaft and at least one intermediate shaft having gears engaging gears on the input shaft, at least one gear in each pair of inter-engaging gears being releasable from its shaft. Such gear-boxes are conventional.

A conventional step-geared gearbox with an ordinary disc clutch between the gearbox and the engine cannot be used to prevent the automobile from rolling backwards when starting on an upward incline as can an automatic planetary gearbox a hydrodynamic torque converter disposed between the engine and the gearbox by regulating the engine speed. In vehicles with manual transmissions, the handbrake is therefore normally used when starting on an incline. When doing this, it is important to carefully coordinate the release of the handbrake with depressing the accelerator and letting up of the clutch pedal in order to prevent the vehicle from rolling initially back down the incline. Many drivers consider this to be a very difficult manoeuvre and therefore choose when starting on an upward incline to « ride » the clutch, i. e. instead of moving one's foot from the accelerator to the brake pedal the throttle is opened slightly over idle speed and the clutch pedal is depressed so that the clutch slips just enough to hold the vehicle stationary. This driving technique results in heavy wear on the clutch discs and when used often results in substantial shortening of the life of the clutch discs.

The purpose of the present invention is to achieve a gearbox of the above mentioned type, which in combination with a conventional disc clutch has the same ability as an automatic transmission with torque converter to prevent the vehicle from rolling backwards when starting on an upward incline, thus eliminating the need to use the handbrake.

This is achieved according to the invention by a one-way clutch being connected between the releasable gear for the lowest forward gear speed and a member solid with the housing, said one-way clutch locking the gear against rotation in the direction for reverse.

The invention provides with simple and inexpensive means a solution which prevents the vehicle from rolling backwards when the lowest gear speed is engaged, and this means that the driver, when he has his foot on the brake pedal and the shift lever in the neutral position, can lift his foot from the brake pedal as soon as the lowest gear speed is engaged without risk of the vehicle rolling backwards.

The invention will be described in more detail with reference to examples shown in the accompanying drawing. Figs 1 and 2 show schematically a five-speed manual gearbox, Fig 3 shows an endview of a one-way clutch and Figs 4 and 5 show schematically a five-speed step-geared

automatic transmission.

In Fig 1, 1 designates a disc in a clutch not shown in more detail here. The disc is non-rotatably mounted on an input shaft 2, which also has nonrotatable gears 3, 4, 5, 6 and 7 for fourth, second, reverse, first and third as well as a free gear 8 with synchronizing means and an engaging sleeve 9 for fifth. On a first intermediate shaft 10, free gears 11 and 12 are rotatably journaled and can be locked to the shaft by means of an engaging sleeve 13 with synchronizing means. A second intermediate shaft 14 has rotatably journaled free gears 15 and 16, which can be locked to the shaft by means of an engaging sleeve 17 with synchronizing means. The intermediate shafts 10, 14, have non-rotatably mounted gears 18, 19, which engage the crown gear in a differential, the housing of which is part of the gearbox housing 21.

According to the invention, a one-way clutch 22 is connected between free gear 12 for the first gear speed and the gearbox housing 21. The one-way clutch 22, which is shown in more detail in Fig 3, has an inner ring 23 solidly joined to the hub of the free gear 12 and an outer ring 24 securely pressed into an opening in the gearbox housing. Between the inner ring 23 and the outer ring 24 there are laid locking elements 25, which permit rotation of the inner ring 23 relative to the outer ring 24 when torque is transferred from the input shaft to the gear 12, but which blocks rotation when there is torque transfer in the opposite direction from the drive wheels of the vehicle via the crown gear 20 and the gear 18 to the intermediate shaft 10. The one-way clutch 22 thus serves as an automatic aid which « takes over » the function of the handbrake when starting on an upward incline in first gear.

The invention is of course not limited to a gearbox of the above described type. Rather it can also be used in other types of gearboxes, for example in a gearbox of the type shown and described in Swedish Patent Application 8 501 541-0.

Such a gearbox is shown in Figs 4 and 5 and in principle differs from the construction described above in that it has two concentrically journaled input shafts 30, 31 with individual clutch discs 32, 33. In the following, we will only describe details of importance for elucidating the blocking function according to the present invention. For a more complete description of the design of the gearbox in question the reader is referred to the above mentioned patent application.

A reversing gear 34 is freely rotatably journaled on the hub 23 of the free gear 12 for the first gear speed. By means of an axially displaceable engaging sleeve 35, the reversing gear 34 can be locked to the hub 23. The gear 34 engages the free gear 36 for the second gear speed on the intermediate shaft 14. As in the embodiment described above, there is coupled between the hub 23 and the

gearbox housing a one-way clutch 22, which assumes the function of the handbrake when starting on an upward incline in first gear by blocking against rotation of the intermediate shaft 10 in a direction opposite to the rotational direction for driving forward.

In the gearbox shown in Figs 4 and 5, the additional advantage is achieved, however, that the one-way clutch also blocks against forward movement when reverse is engaged, and this facilitates starting backwards on an incline in a corresponding manner. This function is obtained by virtue of the fact that the gear 12 for first has the same rotational direction when backing as it does for driving forward, since the reversing function is obtained by reversing the rotational direction of the intermediate shaft 14 when torque is transmitted via the reversing gear 34 and the free gear 36 for second.

#### Claims

1. Motor vehicle gearbox, comprising a housing with at least one input shaft and at least one intermediate shaft having gears engaging gears on the input shaft, at least one gear in each pair of inter-engaging gears being releasable from its shaft, characterized in that a one-way clutch (22) is connected between the releasable gear (12) for the lowest forward gear speed and a member solid with the housing (21), said one-way clutch blocking the gear against rotation in a direction opposite the rotational direction for driving forward.

2. Gearbox according to Claim 1, with two intermediate shafts and two concentrically journaled input shafts, arranged to be driven alternately and disposed in a plane separate from the plane of the intermediate shafts, characterized in that said releasable gear (12) for the lowest gear speed is journaled on one intermediate shaft (10) and is lockable relative to a freely rotatably journaled, reversing gear (34) which engages a gear (36) on the other intermediate shaft (14) for driving said other intermediate shaft in a direction opposite to the rotational direction for driving forward, whereby the one-way clutch (22) blocks the second intermediate shaft against rotation in a direction for driving forward when the reversing gear is locked relative to said releasable gear for the lowest gear speed.

3. Gearbox according to Claim 1 or 2, characterized that the one-way clutch has an outer ring (24) fixed to a wall of the housing, an inner ring (23) fixed to the hub of the releasable gear for the lowest gear speed for driving forward, and blocking elements (24) arranged between the rings, for permitting rotation of the inner ring only in the direction for driving forward.

#### Patentansprüche

1. Wechselgetriebe für Fahrzeuge, das ein Ge-

häuse mit mindestens einer Antriebswelle und zumindest einer Zwischenwelle umfaßt, die Zahnräder besitzt, die mit Zahnradern auf der Antriebswelle in Eingriff stehen, wobei zumindest ein Zahnrad in jedem miteinander in Eingriff stehenden Zahnradpaar von seiner Welle zu lösen ist, dadurch gekennzeichnet, daß eine Einwegkupplung (22) zwischen das lösbare Zahnrad (12) für die niedrigste Vorwärtsgetriebebeschwindigkeit und ein mit dem Gehäuse (21) einteiliges Element gekoppelt ist, wobei die Einwegkupplung das Zahnrad gegen Verdrehung in eine der Drehrichtung für Vorwärtsantrieb entgegengesetzte Richtung blockiert.

2. Wechselgetriebe nach Anspruch 1 mit zwei Zwischenwellen und zwei konzentrisch gelagerten Antriebswellen, die so eingerichtet sind, daß sie wechselweise angetrieben werden und in einer von der Ebene der Zwischenwellen getrennten Ebene angeordnet sind, dadurch gekennzeichnet, daß das lösbare Zahnrad (12) für die niedrigste Getriebebeschwindigkeit auf einer Zwischenwelle (10) gelagert ist und relativ zu einem frei drehbar gelagerten Umkehrzahnrad (34) verriegelbar ist, das mit einem Zahnrad (36) auf der anderen Zwischenwelle (14) in Eingriff steht, um die andere Zwischenwelle in einer der Drehrichtung für Vorwärtsantrieb entgegengesetzten Richtung zu drehen, wobei die Einwegkupplung (22) die zweite Zwischenwelle gegen Rotation in Vorwärtsantriebsrichtung blockiert, wenn das Umkehrzahnrad relativ zu dem lösbaren Zahnrad für die niedrigste Getriebebeschwindigkeit verriegelt ist.

3. Wechselgetriebe nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Einwegkupplung einen äußeren Ring (24), der an einer Wand des Gehäuses befestigt ist, einen inneren Ring (23), der an der Nabe des lösbaren Zahnrads für die niedrigste Getriebebeschwindigkeit für Vorwärtsantrieb befestigt ist und Blockierelemente (24) besitzt, die zwischen den Ringen angeordnet sind, um die Rotation des inneren Rings nur in der Richtung des Vorwärtsantriebs zuzulassen.

#### Revendications

1. Boîte de vitesse pour véhicule à moteur, comprenant un carter comportant au moins un arbre d'entrée et au moins un arbre intermédiaire pourvu de roues d'engrenage en prise avec des roues d'engrenage de l'arbre d'entrée, au moins une roue d'engrenage de chaque paire de roues d'engrenage coopérant les unes avec les autres pouvant être dégagée de son arbre, caractérisée en ce qu'un embrayage uni-directionnel est relié pour la vitesse la plus basse en avant entre la roue pouvant être dégagée (12) et un élément solidaire du carter (21), ledit embrayage uni-directionnel bloquant la roue contre la rotation dans une direction opposée à la direction de rotation pour l'entraînement en avant.

2. Boîte de vitesse suivant la revendication 1, comportant deux arbres intermédiaires et deux

arbres d'entrée montés de façon concentrique, agencés pour être entraînés en alternance et disposés dans un plan séparé du plan des arbres intermédiaires, caractérisée en ce que ladite roue d'engrenage pouvant être dégagée (12), destinée à la vitesse la plus basse, est montée tourillonnant sur un arbre intermédiaire (10) et peut être immobilisée par rapport à une roue inverseur de marche (34) montée folle qui est en prise avec une roue d'engrenage (36) sur l'autre arbre intermédiaire (14) pour l'entraînement de l'autre arbre intermédiaire dans une direction opposée à la direction de rotation pour l'entraînement en avant, l'embrayage uni-directionnel (22) bloquant le second arbre intermédiaire contre la rotation

dans une direction pour l'entraînement en avant lorsque la roue inverseur de marche est immobilisée par rapport à ladite roue d'engrenage pouvant être dégagée, destinée à la vitesse la plus basse.

3. Boîte de vitesse suivant la revendication 1 ou 2, caractérisée en ce que l'embrayage uni-directionnel comporte un anneau externe (24) fixé à une paroi du carter, un anneau interne (23) fixé au moyeu de la roue d'engrenage pouvant être dégagée, destinée à la vitesse la plus basse d'entraînement en avant, et des éléments de blocage (24) disposés entre les anneaux permettant la rotation de l'anneau interne uniquement dans la direction d'entraînement en avant.

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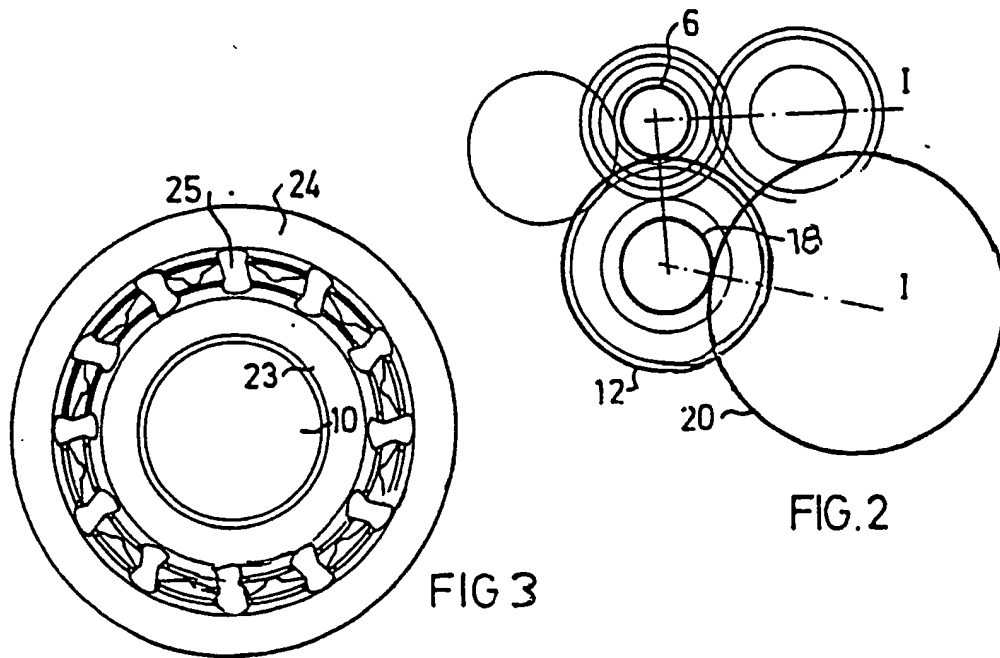
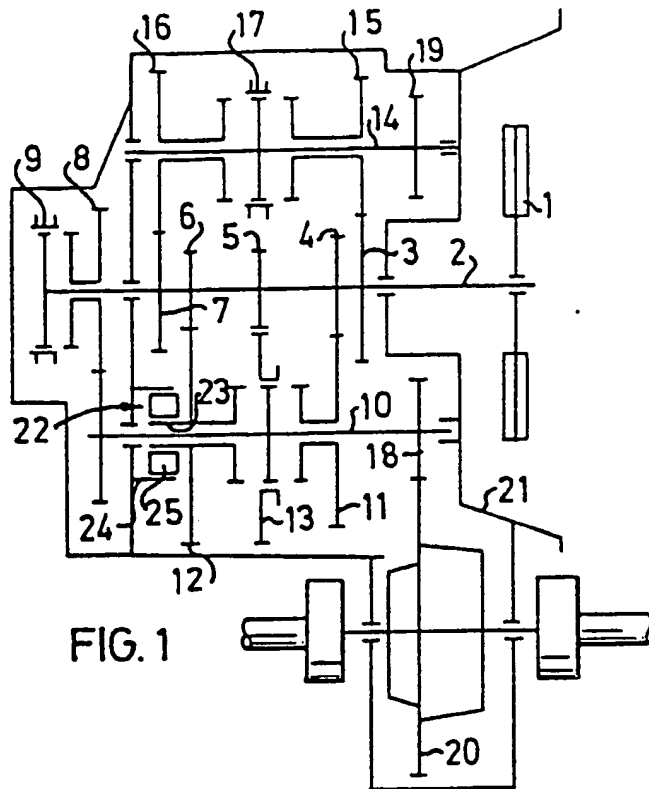
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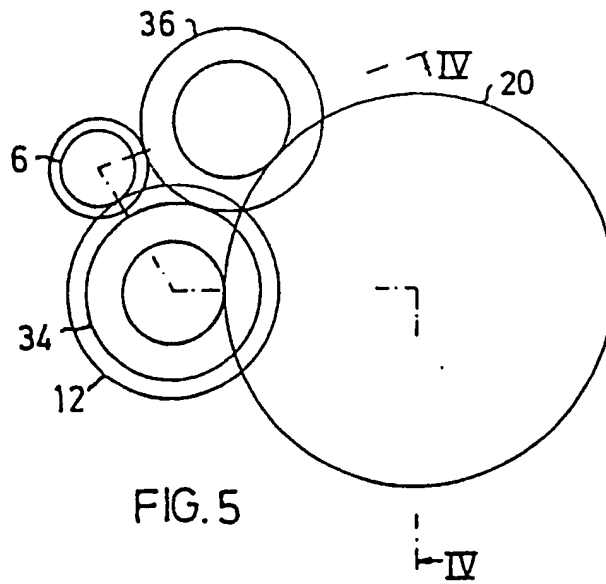


FIG. 5

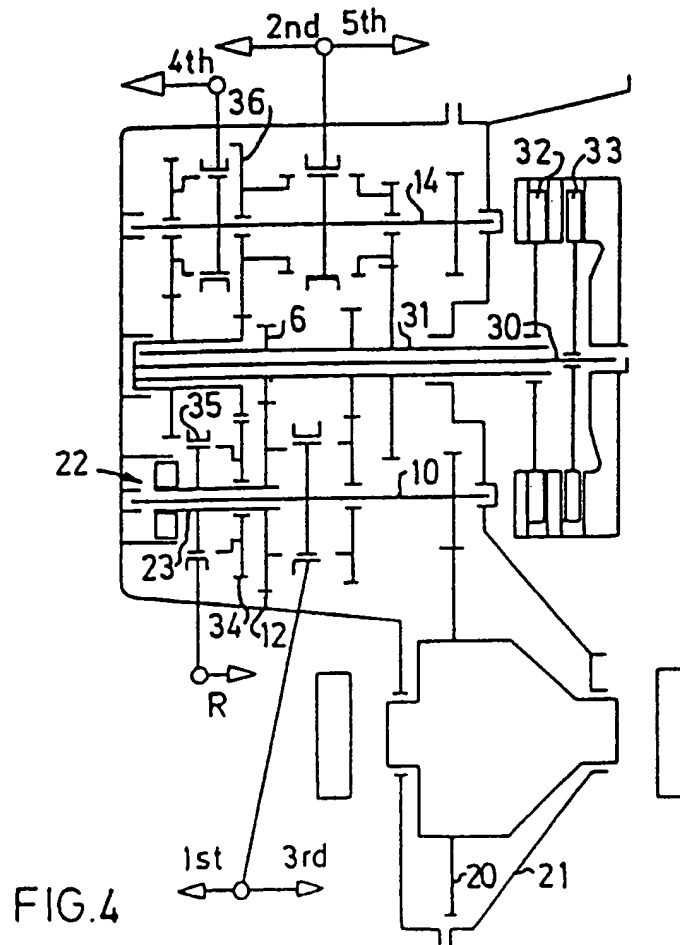


FIG. 4